

# EFFECT OF SEX HORMONE ON GASTRIC SECRETION IN DOG

by

G.S. TANDON, R.C. SHUKLA AND G.P. BHARDWAJ

*Department of Physiology, K. Gs. Medical College, Lucknow*

It has been demonstrated by Clark (4) that reduction of gastric acidity during pregnancy provides an explanation for disappearance of gastric symptoms in nearly 90% of women suffering from peptic ulcer during pregnancy. Such a protective action may be due to increased oestrogen blood level. Gastric secretion is reduced during pregnancy and this alteration is due to a change in reactivity of the parietal cells of gastric mucosa (9). Changes in the levels of androgens and oestrogens have been demonstrated to influence gastric secretory activity in experimental animals (2). A relationship between free acid in the gastric juice and the amount of anterior pituitary like hormone secreted in urine in pregnancy has been reported (6).

The present study deals with effects of exogenous administration of sex hormones or removal of testis and ovaries on gastric secretory activity in dogs.

## METHODS AND MATERIALS

In healthy mongrel dogs of both sexes, gastric pouches were made by the technique previously described (14). The juice was collected through a stainless steel cannula fixed in the pouch and exteriorized in the abdominal wall for a period of three hours, and at the end, all fractions were mixed up, centrifuged, measured and an aliquot (10 ml.) taken out for estimating free and total acid contents in it by the Hawk's technique (7). In order to know the pattern of secretory behaviour in dogs to act as a normal standard, juice was collected and studied for a period of seven days prior to institution of any experimental intervention. Experiments were divided into four groups. In the first group, 5 mg. of oestradiol-dipropionate was administered intramuscularly daily for seven days and its effect on gastric secretion noted for one week. In the second group, similar studies were conducted in four male dogs after administration of 25 mg testosterone propionate daily for seven days. In the third group, unilateral ovariectomy and in the fourth group, bilateral orchidectomy was done in three dogs each. After a period of four days its effect on gastric secretion was noted for a fortnight.

## RESULTS

Perusal of Table 1 shows a statistically significant reduction in volume of gastric secretion only in the third week. Testosterone propionate administration in doses of 25 mg (i.m. daily for seven days) brings about a significant reduction in gastric secretory volume, and total

\*(Estronex, Dumex and Pfizer Co.)

acid contents in the second and third weeks (Table II). No significant changes were found in any of the parameters due to ovariectomy. (Table III). In orchidectomized dogs, there was no reduction in free and total acid contents in the second and third weeks. The reduction in the third week is highly significant (Table IV).

TABLE I

Group 1. (ESTRONEX SERIES)  
(5 mgm.I.M. daily-7 days)

	Mean values (7 days) for the individual animal and the mean in each group of animals				Mean changes from the control group with S.E. and significance	
	S. N.	First week (Control)	Second week (Hormonal phase)	Third week (Post hormonal phase)	Second week	Third week
Volume ml.	1	25.8	23.5	22.9	10.85±4.13 (4) N.S.	27.20±7.94 (4) P < .05
	2	41.9	38.4	22.0		
	3	42.4	40.1	31.9		
	4	43.7	33.5	31.5		
	Mean	38.3	33.9	27.1		
Free Acid M.Eq/L.	1	101.2	105.3	101.4	2.80±2.33 (4) N.S.	13.10±4.17 (4) N.S.
	2	108.4	104.6	95.3		
	3	148.8	140.4	112.1		
	4	117.7	110.6	98.9		
	Mean	119.0	115.2	102.0		
Total Acid M.Eq/L.	1	109.0	111.9	110.0	3.43±1.93 (4) N.S.	13.55±5.36 (4) N.S.
	2	113.1	109.3	98.6		
	3	153.8	146.0	116.5		
	4	127.4	118.3	104.4		
	Mean	125.8	121.1	107.4		

(4) Number of animals., N.S. No significant reduction. P < .05 significant reduction.

TABLE II

Group II (Testosterone Propionate Series)  
(25 mgm. I.M. daily—7 days)

	S. N.	Mean values (7 days) for the individual animal and the means in each group of animals			Mean changes from the control period with S.E. and significance	
		First week (Control)	Second week (Testosterone propionate)	Third week (Post-hor-nal Phase)	Second week	Third week
Volume ml.	1	26.9	23.3	19.0	$18.73 \pm 2.33$ (4)	$28.30 \pm 2.73$ (4)
	2	34.5	27.4	27.4	$P < .01$	$P < .01$
	3	20.1	15.3	13.4		
	4	25.4	21.1	17.1		
	Mean		26.7	21.8	19.4	
Free Acid M.Eq/L.	1	118.9	116.7	114.1	$2.75 \pm 0.63$ (4)	$5.13 \pm 1.68$ (4)
	2	116.9	112.0	112.0	N.S.	N.S.
	3	94.0	90.9	84.6		
	4	122.1	119.8	118.8		
	Mean		112.9	109.8	107.4	
Total Acid M.Eq/L.	1	125.2	122.2	118.1	$3.35 \pm 0.8$ (4)	$5.80 \pm 1.61$ (4)
	2	122.3	116.4	117.0	$P < .05$	$P < .05$
	3	99.9	95.7	89.6		
	4	130.5	127.8	126.6		
	Mean		119.5	115.5	112.8	

(4) Number of animals.  $P < .01$  Highly significant.  $P < .05$  significant.

TABLE III

## Group III (Ovarectomy Series)

	Mean values (7 days) for the individual animals and the means in each group of animals				Mean % changes from control period with S.E. and significance;	
	S.N.	First week (Control)	Second week (Ovariectomy)	Third week	Second week	Third week
Volume <i>ml.</i>	1	30.2	27.6	26.1	$-2.63 \pm 5.0$ (3)	$-20.33 \pm 20.7$ (3)
	2	25.5	27.8	43.3	N.S.	N.S.
	3	46.3	50.3	49.2		
	Mean	34.0	35.2	39.5		
Free Acid <i>M.Eq/L.</i>	1	110.3	101.8	90.0	$-1.47 \pm 3.75$ (3)	$-2.97 \pm 6.33$ (3)
	2	139.8	148.9	144.4	N.S.	N.S.
	3	121.8	128.7	121.2		
	Mean	123.9	126.4	121.2		
Total Acid <i>M.Eq/L.</i>	1	115.7	109.2	93.5	$-1.80 \pm 3.04$ (3)	$4.00 \pm 6.25$ (3)
	2	144.3	153.4	118.8	N.S.	N.S.
	3	127.4	133.4	132.7		
	Mean	129.1	132.0	115.6		
(3) Number of animals.	N.S.	No significant change.				

TABLE IV

Group IV (Orchidectomy Series)

	S. N.	Mean Values (7 days) for the individual animals and the means in each group of animals.			Mean % changes from control period with S.E. and significance.	
		First week (Control)	Second week (Orchidectomy)	Third week	Second week	Third week
Volume ml.	1	51.4	47.7	45.4	7.97±8.03 (3)	9.00±3.83 (3)
	2	43.1	45.5	42.5	N.S.	N.S.
	3	28.9	22.4	24.9		
	Mean	41.1	38.5	37.6		
Free Acid M.Eq/L.	1	111.2	107.0	105.5	3.97±0.73 (3)	6.17±1.07 (3)
	2	133.7	126.6	122.6	P <.05	P <.05
	3	128.2	126.6	121.6		
	Mean	124.3	119.4	116.6		
Total Acid M.Eq/L.	1	118.8	111.3	108.9	4.9±1.08 (3)	7w03±0.64 (3)
	2	140.6	132.5	131.4	P <.05	P <.01
	3	133.2	129.5	124.8		
	Mean	130.9	124.4	121.7		

(3) Number of animals. P <.01 Highly significant reduction. P <.05 Significant reduction. N.S. No significant change.

DISCUSSION

All the dogs in the Group I (Table I) which were treated by Estronex (5 mg. *i.m.* daily) showed a significant fall in volume in the third week only. Statistically no significant change in the free and total acid contents has been observed in this group of dogs. These results are in confirmity with our previous report (14, 15) In that study the response was appreciable after higher and prolonged doses. Nasio (10) reported

that oestrogens prevent gastric ulceration due to decreased secretory activity of gastric mucosa. Quastel and Hochster (11) demonstrated the action of oestrogen hormones including stilboestrol on cell enzyme system. A direct action on the parietal cells seems very probable explanation for the observed effects of stilboestrol on gastric secretion. It is possible that the effect may be exerted indirectly through the other endocrine glands, most probably the pituitary and adrenal glands, but no experimental evidence in support of this is available. Clark (4) reported that though female hormone gives satisfactory results in decreasing the gastric secretory activity yet they cannot be given in larger doses for a prolonged period therapeutically as are present during pregnancy. Ivy (8) demonstrated that ulcerative changes in gastric mucosa were most frequent in males and female hormone had an inhibitory effect on gastric secretion and ulceration. Contrary to the above Abrahamson and Hinton (2) reported ineffectiveness of the ovarian hormone on gastric secretion or in improving the resistance of the gastric mucosa to acid digestion. Schulz (12) reported that animals treated with oestradiol benzoate, presented higher incidence of ulcers than the control. Female hormone seems to have promoting effect on gastric ulcers.

In Group II (Table II) of animals statistically highly significant reduction in volume, and total acid contents have been observed in the second and the third weeks. This is a delayed effect of the male hormone therapy. It seems that fluid shifts and adjustments take longer time in the process. The results are similar to those of Shukla and Tandon (14) who had demonstrated that Andronex 25 mgm (testosterone propionate administered i.m. daily for seven days) depresses the gastric secretory activity and this effect continued even after the withdrawal of the hormone therapy. Schulz (12) pointed out that ulceration was more pronounced in intact females than the gonadectomized rats of both sexes. It is difficult to explain whether male hormones directly act on parietal cells or through mediation of adreno-cortical activity. It is possible that anterior pituitary may also mediate the effect.

In Group III (Table III) of dogs where ovariectomy was done, no statistically significant change in volume, free and total acid contents was observed. On the other hand Singh and Shukla (15) observed it in ovariectomized rats. They also observed that higher peptic activity value were related to higher degree of ulceration. The increase in the degree of gastric ulceration in ovariectomized animals could be due to absence of inhibitory influence of ovarian hormone or adreno-corticoids which may play some role in the production of ulcers.

In Group IV (Table IV) where bilateral orchidectomy was performed, all the experimental dogs showed a marked reduction in free and total acid contents in the second and third weeks. These results are quite contrary to those reported by Antonson (3) who while studying effect of sex hormone on the gastric mucosa of pylorus ligated rats noted that the ulcerative changes were more severe in the intact female rats than the castrated male rats. He also found higher incidence of ulcers in castrated male rats than the control with oestradiol. Abrams and Baker (1) reported that gonadectomy was without any effect on zymogenic cells.

#### CONCLUSION

As a result of present study, the following conclusions have been drawn.

1. Estrones diminishes free and total acid.
2. Ovariectomy does not affect gastric secretory activity.
3. Testosterone propionate significantly reduces gastric secretory volume and total acid content.
4. Bilateral orchidectomy brings about significant fall in free and total acid contents.

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